Histological changes of Maxillary Sinus Wall at Chronic Purulent Sinusitis

Yu. M. Andreychyn

Ternopil State Medical University by I.Ya. Horbachevskiy

Recension – Doc. Georgi Marinov – Sofia

Summary:

Chronic purulent sinusitis, including the odontogenic origin, are accompanied by the substantial alteration of affected mucous membrane by the type of papillary hyperplasia and remodulation of adjoining bone tissue with forming of the osteosclerosis and osteoporosis.

Key words: maxillary sinusitis, mucous membrane, bone tissue, histological changes.

Preface

Sinusitis are very common in ENT practice. According to the literature, they affect 5-10% of Ukraine's population [1, 2]. The frequency of sinusitis in the past decade is increasing [3, 4, 5], and there are new, atypical clinical manifestations of the disease [4]. Chronic sinusitis patients in average 12.4% of treated annually in ENT hospital [6].

According to recent data, acute sinusitis in Germany for one year diagnosed 6.3 million times, and chronic − 2.6 million times. In the U.S., the sinusitis morbidity covered 18% of the total population [7].

Most often is affected maxillary sinus [8, 9, 10], which ranges from 36.4 to 84.4% of total sinusitis [11, 12], more rare − ethmoidal labyrinth, frontal and basilar sinuses.

Despite widespread acute and chronic sinusitis, their pathogenesis requires further investigation, special attention deserve the morphological changes at different clinical forms of the disease. The aim of our study was to investigate pathohistologic changes of mucous membrane and adjacent bone tissue in biopsy material at chronic sinusitis.

Materials and methods

Under observation were 14 patients aged from 18 to 48 years, and who were hospitalized in the ENT department of the regional hospital.

According to the general clinical, radiographic and rhinoscopic investigation, all patients diagnosed with chronic purulent maxillary sinusitis, at 6 of them −

odontogenic origin. Duration of disease ranged from 1 year to 5 years.

Maxillary sinusotomy was performed to all patients. During surgery was conducted sampling biopsy of the maxillary sinus anterior wall. For histological examination the biopsies were fixed in 8% neutral formalin solution, were subjected to mild decalcification in 5% Trilon B and were condensed with paraffin. Serial sections were stained with hematoxylin and eosin. Histopathological examinations were performed in the laboratory of the Department of Pathologic Anatomy and Forensic Medicine (head − prof. Ya.Ya. Bodnar).

Results and discussion

The pituitary-bone biopsies were conventionally divided according to the clinical and morphological studies into 2 groups: 1-st − chronic polypoid sinusitis, 2-d − chronic odontogenic sinusitis.

The research of biopsy material showed that damage of mucous membrane and bone tissue has a different form depending on the duration of the pathological process. The changes that include epithelial layer and stroma we refer to its earlier manifestations. Epithelial lining of the mucous membrane in such cases is usually represented by ciliated cylindrical multilayered epithelium. It is situated on the thickened basement membrane. There is a large number of elongated cells with hyperchromic nuclei and narrow cytoplasm in the basal layers of epithelial lining. These epithelial cells superimposed upon one another, forming layers, confirming the presence of an intensive process of proliferation.

Under the epithelial lining is revealed intense infiltration by lymphocytes, histiocytes and plasmocytes with the development of spongiose connective tissue (Fig. 1).

In some cases, the infiltration is diffuse, in the other – dense with the formation of lymphomas. The blood vessels in the submucosa membrane consist mainly of capillaries. Active productive component causes the formation of false villi as polyps. Thus, these changes indicate the substantial restructuring of mucosa by the type of papillary hyperplasia.

During histological examination of bone biopsies of patients with papillary hyperplasia are revealed the signs of bone remodeling, which corresponded to a mixed form of osteodystrophy. This revealed osteosclerosis of compact component in conjunction with its transformation into spongy tissue on the model of osteoporosis (Fig. 2).

Compact bone has a layered structure and presented with the plate components that are separated by thin layers. Perception of dyes is mosaic. In most of the bone tissue as osteoblasts and osteoclasts are absent, the lumens of haversian canals are dilated. In the compact tissue the cavity of spongy substance are penetrating. This section of bone tissue contains a lot of unclosed cavities. They are irregularly shaped. Trabeculas with microcracks and fissures form looplike grid. Blood vessels in areas of resorption are plethoric, with endothelial swelling.

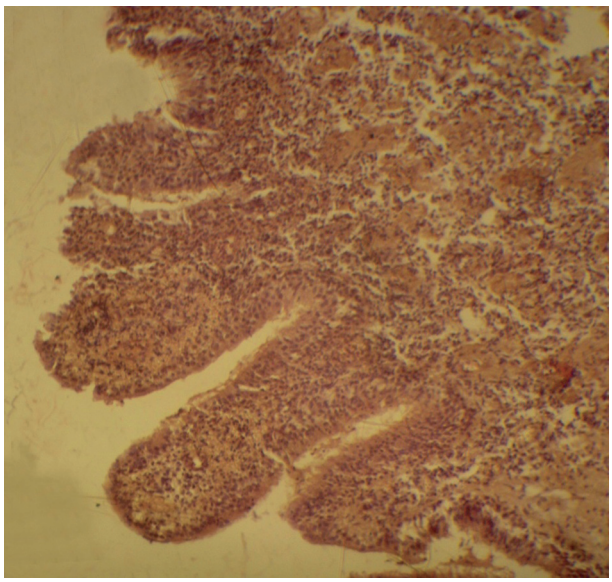

Fig.1. Papillary hyperplasia. Coloring with hematoxylin and eosin. X 100.

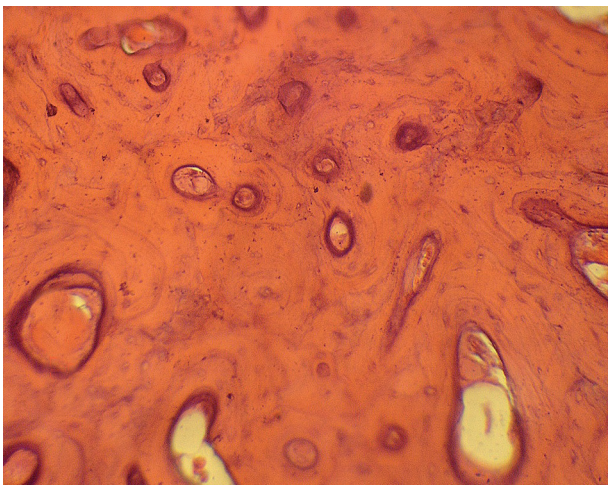

Fig. 2. The condition of the bone tissue in areas adjacent to papillary hyperplasia. Osteosclerosis and expansion of bone lacunas. Coloring with hematoxylin and eosin. X 100.

In most cases (10 of 14) is noted the late manifestations of structural rebuilding of mucosa at chronic polypoid sinusitis. In these terms the atrophic, destructive and sclerotic processes prevail over inflammatory. If in the first group of patients the proliferative changes in the epithelial cells were dominated, in the second − destructive and desquamative processes with the proliferation of epithelial cells. Stroma of papillary outgrowths is represented by mature fibrous tissue, often with symptoms of hyalinosis. It is significant that the fibers intertwine to form a false moves with forming of microcysts creating morphological picture of deforming sinusitis (Fig. 3).

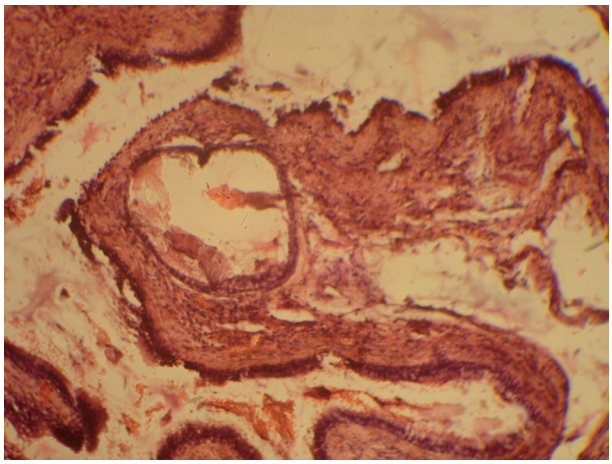

Fig. 3. Deforming polypoid sinusitis. Sclerosis of polyps stroma with forming the microcysts. Coloring with hematoxylin and eosin. X 100.

The recent are lined by cubical epithelium cells with metaplasia in the flat. Among mature connective tissue placed formed arterioles. Their walls are thickened due to hyperplasia of muscle cells, and in the adventitia is poorly expressed lymphoid infiltration.

At histological examination is revealed that the periosteum is presented by membrane reticulated connective tissue, among which many thick-walled vessels. The last undergoes by metaplasia, that resulting in focal clustering of chondrocytes and osteoblasts.

In biopsies of bone tissue at the late manifestation of chronic polypoid sinusitis the features of high remodeling predominated, that expressed in the dominating the osteoporosis signs over fibrous osteoiditis. The bone tissue is represented by thin plate creations. The bone beams constructed of osteonic tissue, forming a lattice tissue. The cavities are dilated, filled with mesenchymal cells (Fig. 4). Osteoclasts are activated, penetrate the main substance, forming notches. In some places the perytrabecular fibrosis and osteoid interlayers around extended gaversian channels are founded. The lasts penetrate bone tissue in different directions, disrupting the structure of compact tissue.

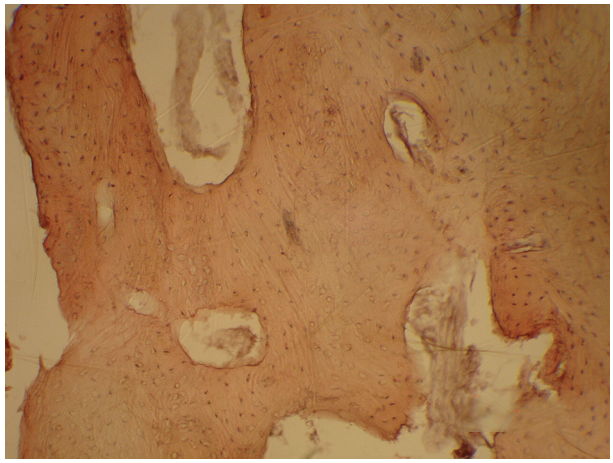

Fig. 4. Osteoporosis. Islets of mesenchymal cells in dilated bone lacunas.
Coloring with hematoxylin and eosin. X 100.

At odontogenic sinusitis is revealed a mosaic morphological picture as concerning the mucosa so underlying bone tissue. Mucous membrane is sclerosed with lymph-plasmocytic infiltration of the stroma (Fig. 5).

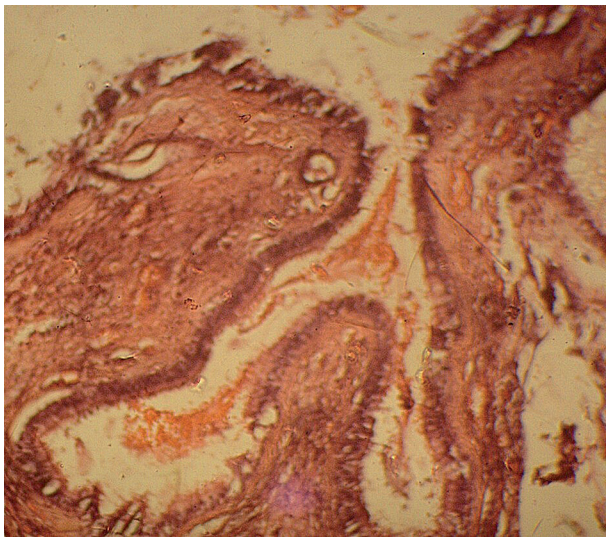

Fig. 5. Chronic polypoid sinusitis. Sclerosis of the stroma with lymph plasmocytic infiltration. Coloring with hematoxylin and eosin. X 100.

The disintegration of epithelial layer is noted and the presence of small erosions due to desquama-

tion of plethoric epithelial cells. The bone tissue is laminar with foci of osteomalacia and overgrowth of spongiose connective tissue at different stages of maturation. The number of osteoblasts and osteoclasts is increased. The appearance of large cavities, thinning plates, their separation evidenced about the activation of resorption (Fig. 6).

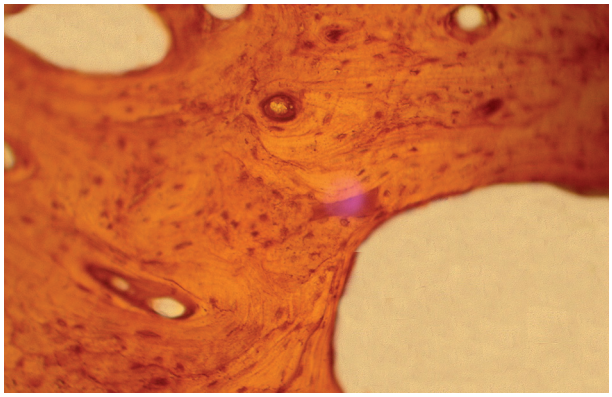

Fig. 6. Condition of bone tissue in areas adjacent to the polyps. Expansion of bone lacunas. Coloring with hematoxylin and eosin. X 100.

The process of resorption combined with accumulation of osteoid. Thus, remodeling of bone tissue manifested in the osteodystrophy and formation of osteosclerosis.

Conclusions

1. At chronic purulent sinusitis the intense proliferation of epithelial cells with subsequ end formation of false villi as polyps occurs.
2. Under the condition of papillary hyperplasia of the mucous membrane in bone tissue the remodeling processes on the type of osteosclerosis in combination with osteoporosis are prevail, while at deformational sclerotic polypoid sinusitis dominated the signs of osteoporosis.
3. Histological data can adequately follow the sequence of the process of bone tissue remodeling at chronic sinusitis. Under the condition of odontogenic sinusitis prevail osteodystrophy with presence of osteomalacia and formation of osteosclerosis.

References

1. Albegger K. Die Sinusitis // Wien. med. Wschr. – 1982. – B.132. – N 63. – P. 121-127.
2. Klossek J.M., Mesbah K. Presentation and treatment of acute maxillary sinusitis in general practice: a French observational study // Rhinology. – 2011. – N 49 (1). – P. 84-89.
3. Безшапочний С.Б., Лобурець В.В., Кайдашев І.П. Патогенетичні аспекти в лікуванні осіб із захворюваннями порожнини носа та навколоносових пазух // Журн. вушн., нос. і горл. хв. – 1999. – № 3, додаток. – С. 19-22.
4. Mendes Neto J. A., Guerreiro V.M. at all. The role of maxillary sinus puncture on the diagnosis and treatment of patients with hospital-acquired rhinosinusitis // Otorhinolaryngology. – 2012. – N 78 (4). – P. 35-41.
5. Sahin Y.F., Muderris T., Bercin S., Sevil E., Kırıs M. Chronic maxillary sinusitis associated with an unusual foreign body: a case report // Case Report Otolaryngol. – 2012. – N 2. – P. 54-56.
6. Богданов В. В., Балабанцев А.Г. Одонтогенный гайморит // Журн. вушн., нос. і горл. хв. – 2005. – № 4. – С. 72-78.
7. Бачерт С. Современная диагностика и лечение синусита и полипоза носа // Ринология. – 2004. – № 1. – С. 47-65.
8. Древняк Н.С., Окунь О.С., Ретинская Н.Л. Факторы, способствующие росту заболеваемости детей Донбасса синуитами // Журн. вушн., нос. і горл. хв. – 2000. – № 2. – С. 61-63.
9. Зеленкин Е.М., Прозоровская К.Н., Петровская А.Н. Клинико-иммуноло- гические аспекты вибротерапии синуита // Вестн. оториноларинг. – 2000. – № 5. – С. 66-69.
10. Лопатин А.С., Тарасова Е.И., Шишмарева Н.Я. Частота выявления патологии околоносовых пазух по данным магнитно-резонансной и компьютерной томографии // Вестн. оториноларинг. – 1996. – № 6. – С. 11-13.
11. Stephens J.C., Saleh H.A. Evaluation and treatment of isolated maxillary sinus disease // Curr. Opin Otolaryngol Head Neck Surg. – 2013. – N 21 (1). – P. 50-57.
12. Cantin L.M. Coronado G.C. Maxillary sinusitis of dental origin. A case report and literature review // Odontostomat. – 2009. – N 3 (1). – P. 5-9.